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(54) Low ammonia bleach
compositions

(57) A thickened hair bleaching composition which produces only trace amounts of ammonia gas when applied to the users hair, having a water phase accounting for 80 to 100% of the total weight of the composition and an ammonium ion concentration in the water phase which is less than about 0.55% of the total composition which comprises 2-20% of a per-compound, 1.5-7% of hydrogen peroxide, an amine or quaternary ammonium compound, 4-8% of at least one water-soluble surfactant thickener, a buffering agent for maintaining the composition at a pH of from about 9 to 12, and the balance is water. The composition can contain additional ingredients including a sequestering agent, a viscosity modifier and a water-insoluble surfactant thickener.

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SPECIFICATION

Low ammonia bleach compositions

- 5 This invention relates to hair bleaching compositions containing a high degree of water-soluble surfactants and water-soluble compounds, and reduced levels of ammonium ions in the water phase thereby providing substantially reduced ammonia gas production and a more aesthetically pleasing result.

10 Any process relating to the treatment of hair must take into account a large number of variables. Bleaching is basically a process to remove natural color from hair. The hair color, i.e. the degree of hair 15 lightening desired by a patron may vary from the mere highlighting of hair through to the palest blonde. Bleaching compositions must therefore be capable of producing mild lightening to high lightening and all degrees of lightening in between. In addition, an entire head of hair may be bleached or only 20 portions thereof, i.e. new growth or "root areas". Bleaching compositions for streaking, frosting, or tipping may be self applied or operator assisted to gain special blonding effects.

- 25 Bleaching compositions used on hair differ from those used with textiles, fabrics, hard surface cleansing and the like in that hair bleaching compositions, in addition to oxidizing and destroying the colored melanin of the hair, must be suitable for use in contact with the human skin and must not damage the 30 hair excessively. Furthermore, since hair bleaches are a member of the class of materials known as cosmetics, it is desirable that they be aesthetically acceptable to the user. Finally, it is desirable that a hair bleaching composition remove the melanin coloration from the hair as efficiently as possible, both for the sake of convenience and to help prevent damage to the hair and irritation to the skin and scalp. Most bleaching systems required exposure to 40 the hair for periods from a few minutes to as long as about 2 to 3 hours, depending upon the desired degree of bleaching.

Hair bleaches commonly consist of a peroxide oxidizing agent, bleach enhancing agents, and a variety of additional cosmetic and bleach stabilizing 45 agents. Oxidizing agents such as the various hypochlorites and halogenated cyanuric acid compounds suitable for use on hard surfaces and in fabric bleaching are not suitable for use on hair since they 50 are too damaging and too irritating to the skin. Peroxide bleaches used on hair must be "activated", this being accomplished by the use of an "activating" agent to adjust the pH to a basic range. The most common material for adjusting the pH of 55 peroxide hair bleaching compositions is an aqueous solution of ammonia, commonly referred to as ammonium hydroxide.

The prior art discloses that aqueous solutions of certain compounds, namely hydrogen peroxide and 60 hydrogen peroxide generating compounds such as peroxy compounds, e.g. persulfates, perborates, percarbonates, are effective in bleaching human hair or keratinous materials. In an effort to increase the rate of bleaching with these hydrogen peroxide products, an activator is used in conjunction with the

hydrogen peroxide, the activator generally being an ammonium, an alkali metal hydroxide or an alkali metal hydroxide producing compound.

- 70 Hair lightening lotions used in two and three component systems typically contain between 2 and 5.5% by weight ammonium hydroxide. Generally, at least half this amount is unneutralized and is present in the lotion as $\text{NH}_3 \cdot \text{H}_2\text{O}$. Because of the high concentration of neutralized and unneutralized 75 ammonium ion bleach systems currently in consumer use today have a characteristic ammonia odor. As a result, bleach mixtures are not as aesthetic to use as other cosmetic preparations.

However, if ammonia or ammonium hydroxide is 80 replaced by a higher molecular weight less volatile amine, the resulting bleach mixture is more damaging (for the same degree of lightening) to the keratine hair fibers. For example, U. S. Patent 2,283,350 to Baum discloses the use of aliphatic 85 amines and hydroxyaliphatic amines as substitutes for ammonium hydroxide in hair bleaching compositions. Moreover, U. S. Patent 3,816,615 to Zeffren et al discloses hair bleaches containing guanidine compounds in place of ammonium hydroxide. 90 Furthermore, to be effective, a bleach composition must remain in place for the time required to effectively lighten the hair, retaining while in place, the proper alkalinity and moisture content needed to continue the bleaching action. The bleach composition must form a foam of limited height and of sufficient viscosity to hold in contact with the hair the 95 bleaching constituents and the oxygen released. The conventional bleaching compositions known in the art accomplish this by incorporating significant quantities of various types of water-insoluble thickeners, oils and fillers. For example, U. S. Patent 100 3,651,209 to Cohen describes the use of calcium carbonate, magnesium carbonate, plaster of Paris and other inert fillers such as talc, kaolin and bentonite as suitable thickening agents for bleaching compositions. "White henna" (i.e. mixtures of magnesium 105 carbonate and magnesium oxide, magnesium trisilicate or the like) and other insoluble adsorbent materials have also been described as useful aids to build viscosity in bleaching compositions.

110 Hair lightening lotions presently in use are additionally known to contain substantial quantities of water insoluble esters, alcohols, ethoxylates and/or propoxylates to create viscosity. The most common 115 alcohol used is the C_{18} oleyl derivative. The water insoluble surfactants form gels when the lotion is mixed with aqueous peroxide solutions. The water insoluble gel helps keep the bleach mixture on the hair fibers and prevent it from running or creeping away from the hair shaft. The use of water insoluble surfactants, however, greatly affects the lightening ability of the bleach mixture. To overcome reduced bleaching activity, high levels of ammonia are required. Studies have shown that as the surfactant 120 becomes more water insoluble, the lightening ability of the bleach system decreases. The functional grouping of the surfactant appears to have little effect upon the efficiency of the resultant bleach mixture as long as water solubility is maintained.

130 Accordingly, to provide an improved peroxygen

bleaching composition producing very little unpleasant ammonia odor and having the proper consistency throughout the bleaching operation to provide good lightening results while holding the amount of hair damage incurred by bleaching to an acceptable minimum level, it has been surprisingly found that this can be attained by keeping both water insoluble ingredients and amine levels to a minimum. As a consequence, lightener lotion formulations should contain surfactants which form soluble gels when mixed with peroxides and/or persulfates. The above criteria for solubility/gel formation places practical restrictions on the type of surfactants that can be used.

Accordingly, one aspect of the invention to be disclosed herein is a thickened hair bleaching composition comprising:

(a) 2 to 20 weight percent of at least one percompound selected from the group consisting of an ammonium-, alkali metal- and alkaline earth metal-perborate, persulfate, percarbonate, and carbonate peroxide;

(b) 1.5 to 7 weight percent of hydrogen peroxide;

(c) an amine or quaternary ammonium compound selected from the group consisting of ammonium hydroxide, morpholine, mono-, di-, and trialkanolamine, and mono-, di-, and trialkylamine, wherein the alkyl or alkanol substituents have a carbon chain length of 1 to 4 carbon atoms;

(d) 4-8 weight percent of at least one water-soluble surfactant thickener;

(e) a buffering agent for maintaining the composition at a pH of from about 9 to 12; and

(f) the balance is water, wherein the ammonium ion concentration in the water phase is less than about 0.55 weight percent based on the total composition resulting in substantially only trace amounts of ammonia gas produced as a result of interaction of these ingredients with each other or with hair.

Additionally, the composition according to the invention can contain, respectively, up to about 0.5 weight percent of a sequestering agent, 1.5 weight percent of a viscosity modifier, and 20 weight percent of at least one additional water-insoluble ingredient selected from the group consisting of surfactants, perfumes, oils, opacifiers, and dyestuffs.

Preferably, the composition according to the invention can contain, respectively, about 6-8 weight percent of the percompound, 3.2-3.7 weight percent of hydrogen peroxide, and include as the water-soluble surfactant thickener the 8.5 mole ethoxylate of cocoyl fatty acid. Additionally, the pH of the resulting composition is preferably about 9.7 to 10.3.

The water-soluble surfactant thickener can be selected from the group consisting of:

(a) an alkylene glycol or an alkylene glycol ether alcohol of the formula:



wherein R^a is H or alkyl having 1 to 4 carbon atoms and R^b and R^c are divalent alkylene radicals having 2 to 4 carbon atoms and n is a number from 0 to 150;

(b) a long chain fatty acid soap of the formula $(R^cCOO)_nM$

wherein R^c is the hydrocarbon moiety of a long chain

fatty acid having 10 to 20 carbon atoms, M is a monovalent or polyvalent salt-forming group and " A " is the valence of group M ;

(c) a long chain polyoxyalkylated compound selected from the group consisting of a polyoxyalkylated long chain fatty alcohol, a polyoxyalkylated polyhydroxyalkyl ester of a long chain fatty acid; a polyoxyalkylated long chain amine; a polyoxyalkylated long chain fatty acid; a polyoxyalkylated long chain fatty acid amide; a polyoxyalkylated long chain alkylphenol and polyoxyalkylated laurate esters of sorbitol and its anhydrides containing about 8 to 300 oxyalkyl groups in the structure; and (d) mixtures thereof.

The thickened hair bleaching compositions in accordance with the invention herein generally have a viscosity in the range of 5000 to 100,000 centipoises.

As was previously mentioned, it is commonly accepted practice to incorporate an amine or quaternary ammonium compound in a peroxygen bleaching system to provide activation in the bleaching process.

Bleaching studies have surprisingly indicated that very good lightening, resulting in minimal hair damage, can be obtained with lotions containing an ammonium ion concentration of 0.55 weight percent or less based on the total composition weight, while at the same time having a water phase that accounts for 80 to 100 weight percent of the total composition. Studies have also indicated that hair lightening is not substantially affected by ammonia basicity, i.e. the ammonia may nominally be present as either free $NH_3 \cdot H_2O$ or as the neutralized ammonium ion, NH_4^+ . From a cosmetic viewpoint, the ammonium ion is preferable to free ammonia.

Because of the equilibrium between NH_3 , $NH_3 \cdot H_2O$, NH_4OH , NH_4^+ and OH^- , it is not possible to have just one species present in an aqueous medium. The relative proportion of ammonia to ammonium can be shifted by pH, ionic strength, pressure and any other chemical technique that affects the concentration of each specie in the equilibrium constant. However, merely reducing amine or quaternary ammonium content, without also maintaining the higher concentrations of water-soluble components, or vice versa, as taught herein does not provide satisfactory hair lightening results. Moreover, to try to compensate for the inferior lightening resulting from using lower amine or quaternary ammonium concentrations by either using high concentrations of peroxygen compounds, alkaline ingredients, longer time periods for bleaching the hair, or higher temperature during the bleaching process will result in unsatisfactory damage levels to the hair. It is the intent of this invention to adjust the formula in such a way so as to favor the formation of ammonium ion and keep the concentration of free ammonia as close as practical to the value dictated by the equilibrium constant.

One of the essential ingredients present in the bleach compositions according to the invention herein is at least one percompound in a useful concentration range of about 2 to 20%, and preferably 6 to 8%. It is pointed out that % throughout the specifi-

cation are weight percent based on the total weight of the composition, unless otherwise indicated. The percompound provides an additional source of oxygen generation necessary for bleaching, other than hydrogen peroxide. Such percompounds are not limited to but can be selected from the ammonium-, alkali metal- and alkaline earth metal-perborates, persulfates, percarbonates, and carbonate peroxides. The term "alkali metal" and "alkaline earth metal" as used herein and throughout the specification are deemed to have their ordinary accepted meaning in the art.

It is also essential to have present hydrogen peroxide in a useful concentration range of about 1.5 to 7% to provide bleaching of the hair. Stabilizers for the hydrogen peroxide, such as phenacetin, may also be present in minor amounts. Preferably the hydrogen peroxide concentration is from about 3.2 to 3.7%.

A third essential ingredient is a water-soluble amine or quaternary ammonium compound for providing necessary activation of the peroxide for enhanced bleaching, and also serving additionally as a pH adjusting agent and aiding in thickening the composition by the formation of water-soluble soap gels with fatty acids. The amine or quaternary ammonium compound most often used, and that preferred, is ammonium hydroxide because of its ready availability and effectiveness as a peroxide activator. However, other less effective amines can be used, typically in larger quantities, such as an amine or quaternary ammonium compound selected from the group consisting of at least one of morpholine, mono-, di-, trialkanolamine, and mono-, di-, and trialkylamine, wherein the alkyl or alkanol substituents have a carbon chain length of 1 to 4 carbon atoms.

As previously noted, it is critical that the ammonium ion concentration in the water phase of the bleaching composition be less than about 0.55% to prevent the formation of more than trace amounts of ammonia gas by the composition during the hair bleaching process and thereby overcoming the problems associated with the prior art, producing cosmetically pleasing results. Therefore it is apparent that the resulting ammonium ion concentration comes about from many factors not the least of which is the amount of ammonium compounds including ammonium percompounds present in the composition which are capable of ionizing in water to form the ammonium ion. Also affecting the ammonium ion concentration is the amount of other compounds that react with (e.g. neutralize) the ammonium ion, such as fatty acid compounds. Finally, there are factors associated with the equilibrium in solutions between the ammonium ion, ammonium hydroxide, and ammonia gas. Furthermore, it is observed that the use of amines in place of ammonium hydroxide will not result in the formation of ammonium ion, but requires greater amounts of the same because of lower efficiency compared to ammonium hydroxide.

It is essential to include from about 4 to 8% of at least one water-soluble surfactant thickener. These are well known to anyone skilled in the art. For example, such water-soluble surfactant thickeners are those

described as "coupling agents" at column 5, line 29 to column 6, line 56 of U. S. Patent 3,811,830 to R. DeMarco issued May 21, 1974, and incorporated by reference herein. Additionally, useful are ethoxylated laurate esters of sorbitol and its anhydrides such as with 80 moles ethylene oxide (Tween 80); acid ethoxylates such as di-stearic acid with 150 moles ethylene oxide (PEG 6000 Distearate); and block copolymers of ethylene oxide and propylene oxide (Pluronic). A preferred surfactant is cocoyl fatty acid ethoxylated with 8.5 moles of ethylene oxide.

The useful pH range for using the bleaching compositions as herein disclosed is from about 9 to 12, although preferably it is about 9.7 to 10.3. Below the pH of 9, insufficient bleaching action occurs; whereas above 12 excessive hair damage occurs.

To maintain the proper pH range, a buffering agent or pH adjustment agent is found to be essential. In addition to the alkalinity provided by the amine or quaternary ammonium compounds, useful agents are the alkali metal metasilicates such as sodium metasilicate; alkali metal carbonate, ortho-, meta- and tripolyphosphates.

Finally, water is an essential ingredient in providing the proper medium for the bleaching process to occur as previously discussed, and makes up the balance of the composition except for water-insoluble ingredients and other optional additives.

Among the optional additive ingredients are sequestering agents for complexing metal ion impurities which would tend to affect the stability of the hydrogen peroxide. Such sequestrants which may be present in a concentration up to about 0.5% and include the unneutralized and/or the alkali metal salts of nitrilotriacetic acid and alkylene polyamine polycarboxylic acids having the formula $(\text{HOOCCH}_2)_x\text{N}[(\text{CH}_2)_y\text{NCH}_2\text{COOH}]_z\text{CH}_2\text{COOH}$ wherein x and y may vary independently from 1 to 4. Representative of such acids are ethylenediaminetetraacetic acid and ethylenediaminetriacetic acid.

Also present may be up to about 1.5% of a viscosity modifier which can include water-soluble straight chain aliphatic alcohols (e.g. ethanol and butanol), aldehydes (e.g. acetaldehyde and butyraldehyde), ketones (e.g. acetone and 2-hexanone), and glycols (e.g. ethylene glycol and butylene glycol).

Additionally, the compositions can optionally include up to about 20% of at least one additional water-insoluble ingredient which includes for example, surfactants, perfumes, oils, opacifiers and dyestuffs (including dyes and dispersible pigments).

Such dyestuffs include for example, D & C Green #6, FD&C Yellow #3, and pigments like ultramarine blue and disperse blue 1.

Typical opacifiers include abietic/lauric ether polyesters, and polystyrene.

Oils include non-volatile oils such as mineral oil, isopropyl myristate, diisopropyl adipate, and volatile or essential oils such as peppermint, clove oil, and eucalyptus oils.

Typical of the water-insoluble surfactants that can be used for thickening and emulsifying properties are those well known in the art such as those dis-

closed in U. S. Patent 3,811,830 to DeMarco at column 3, line 64 to column 5, line 6, which is incorporated by reference herein, called "oily materials."

- 5 Still other optional additives can include water-insoluble fats and waxes derived from natural or synthetic sources (e.g. beeswax or spermaceti) and skin emollients well known in the art.

- It is again pointed out that the use of water-soluble surfactant thickeners are essential, optionally in combination with limited quantities of the aforementioned water-insoluble ingredients, to provide for a low ammonia bleach composition in accordance with the invention herein. It is pointed out that the use of natural gums (e.g. xanthum or guar gum) and cellulose-based thickening agents (e.g. carboxymethylcellulose derivatives) with or without solvents such as low molecular weight alcohols and ketones do not provide the necessary thickening properties for use herein. The gums and cellulose-based agents being too difficult to conveniently mix

- and requiring excessive time to hydrate in order to build the necessary viscosity to maintain the bleaching composition on the hair. Solvents which generally couple oil-soluble materials and water-soluble surfactants produce compositions with low viscosity and are unsuitable for bleaching keratin fibers.

- In the examples that follow the test methods used for evaluating bleaching (i.e. hair lightening effectiveness) and alkaline solubility (i.e. hair damage) are described as follows.

- 30 *Test Method for Evaluating Bleaching Effectiveness*
Surfactants and their effect upon lightening and damage were evaluated as part of a three component system. The system contained a powdered activator, a lotion and a developer. The chemical composition of the activator and developer were kept constant with the lotion being the vehicle for the evaluation of the surfactant. The activator had the following composition:

ACTIVATOR

	<i>Ingredient</i>	<i>Grams</i>	<i>W/W%</i>
	($\text{Na}_2\text{Si}_2\text{O}_5$)	2.1	9.05
	Sodium Lauryl Sulfate	0.5	2.15
45	Methocel 60 HG (Hydroxypropylmethyl cellulose)	0.3	1.30
	Cabosil M5 (fumed Silica Dioxide)	0.3	1.30
	Potassium Persulfate	10.0	43.10
	Sodium Persulfate	10.0	43.10
50		23.2	100.00

The lotion consisted of 0.5% monoethanolamine (i.e. MEA) and 99.5% of the surfactant to be evaluated.

- 55 Bleaching tests were done as follows:

- Twenty-three grams of activator were added to 4 oz. of a 6% aqueous hydrogen peroxide solution and shaken. Sixty grams of the test lotion was then added and shaken until thoroughly mixed. The pH and viscosity of the mixture were then measured. The mixture was spread over and through a swatch or brown pigmented hair. The swatch consisted of a blend of commercially available virgin hair approximately nine inches long. The bleaching was accomplished in a glass dish placed atop a constant temperature bath set at 38°C. The bleaching time was one hour with the swatch being turned over and the bleach mixture "reworked" every fifteen minutes. At the end of one hour, the bleach mixture was rinsed from the hair and the swatch shampooed with a mild shampoo. The swatch was then visually compared to a standard. If the swatches were comparable in lightening to the standard, the reflectance of each swatch was accurately measured at 560 mμ on a Beckman DU-2 Spectrophotometer.

- Where the surfactant was supplied as powdered solid material, the necessary MEA and solid surfactant are dissolved in the 6% hydrogen peroxide solution. The activator is then added to the resulting lotion/peroxide mixture and shaken until uniform. The bleaching process is the same as previously described.

Test Procedure — Alkaline Solubility Test

- Bleach hair swatches at 38°C. for 1 hour in bleaching composition. Then dry 1 gram sample of bleached hair for 3 hours at 110°C. Weigh the dried hair sample. Then immerse hair for 1 hour in 100 ml. of 0.1 N sodium hydroxide at 66°C. Remove hair from sodium hydroxide solution and rinse with distilled water. Follow with rinse of 1% acetic acid solution. Again rinse with distilled water. Dry hair swatch for 3 hours at 110°C. Weight sample and calculate weight loss. The greater the weight loss the greater the hair damage that has occurred during the bleaching process.

- The standard used was a commercially available Clairol Naturally Blonde Quick Lightening Kit comprising a three component system; 60 g. of lotion; 120 g. of developer and 28 g. of activator (208 g. total). Percent composition is as follows:

	CHEMICAL NAME	WEIGHT %
	<i>Lotion</i>	
	Ammonium Hydroxide (29% aqueous solution)	2.45
	Disodium ethylenediamine tetraacetic acid	0.30
5	Isopropanol	3.75
	Ethoxydiglycol ¹	1.01
	Ethoxylated nonylphenyl (10 moles of ethylene oxide) ^{2*}	1.59
	Oleic acid	10.10
	Polyethylene glycol ether of tridecyl alcohol (6 moles of ethylene oxide) ^{3*}	1.20
10	Ethylhydroxymethyl oleyl oxazoline ⁴	3.17
	Polyethylene glycol amine of Soya Acid (5 moles of ethylene oxide) ^{5*}	3.17
	Water	2.22
15	Fragrance	0.14
	<i>Developer</i>	
	Ethoxylated Nonylphenyl (4.0 moles of ethylene oxide) ^{6*}	2.88
	Ethoxylated Nonylphenyl (9.0 moles of ethylene oxide) ⁷	2.88
	Cetyl Alcohol ⁸	0.14
20	Hydrogen Peroxide (50% aqueous solution)	7.96
	Water	44.68
	<i>Activator</i>	
25	Silica ^{8*}	0.20
	Sodium metasilicate	1.82
	Sodium lauryl sulfate	0.16
	Disodium ethylenediamine tetraacetic acid	0.16
	Ammonium Persulfate	2.80
30	Potassium Persulfate	8.28
		100.00
35	1. Trade Name: Carbitol PM 600	
	2. Trade Name: Igepal DM 530	
	3. Trade Name: Emulphogene BC-610	
	4. Trade Name: Alkaterge C	
	5. Trade Name: Varonic L 205	
	6. Trade Name: Igepal CO 430	
40	7. Trade Name: Igepal CO 630	
	8. Trade Name: Cabosil M5	

Note: All of the oleic acid was converted to the water-soluble salt form.

45 This composition had an alkaline solubility of 30.2% (i.e. 30.2 wt.% of 1 g. sample dissolved in alkaline solution). Ammonium ion concentration - 1.70 wt./; water-soluble phase - 87.65 wt.%. In the Naturally Blonde composition and the examples that follow, the designation "*" indicates that the particular ingredient is not water-soluble or only slightly water-soluble. Also, the wt. % of the water-soluble phase is determined by subtracting from 100% the wt. % of insoluble ingredients.

55 Additionally, the maximum ammonium ion concentration in the composition is determined by assuming complete ionization of the ammonium percompound and ammonium hydroxide.

In accordance with the aforementioned Bleaching and Alkaline Solubility Test methods, bleaching compositions including the following water-soluble surfactant thickeners tested and gave comparable and satisfactory light reflectance and alkaline solubility levels as that for Naturally Blonde.

	<i>Chemical Class</i>	<i>Trade Name</i>
	Ethoxylated primary fatty amine	Ethomeen C/25
	Ethoxylated fatty acids	Ethofat 242/25
5	Ethoxylated dialkyl quaternary ammonium salts	Ethoquad 18/25
	Ethoxylated fatty alcohols	Brij® 35
	Propoxylated fatty alcohols	Procetyl® 50
	Ethoxylated lanolin	Solulan 75
10	Ethoxylated lanolin alcohols	Solulan 25
	Acetylated polyoxyethylene lanolin derivatives	Solulan 97
	Nonylphenoxypoly(ethyleneoxy) types	Igepal CO-630
	Polyethylene/propylene glycols	Pluronic/Carbowaxes
	Polyethylene glycol 1000 monostearate	Collemol 510

15 In the Examples 1-14 that follow, the resulting bleaching compositions had a pH of 9.8-10 and were evaluated using the aforementioned test methods for bleaching and alkaline solubility, except where indicated otherwise, providing similar light reflectance and solubility levels to that for Naturally Blonde. In Examples 8-14, the entire composition was water-soluble and the ammonium ion concentration was 0.514 wt. %.

EXAMPLE 1

25 Three component system; 66 g. of lotion; 120 g. of developer; 28 g. of activator. (214 g. total) The activator was mixed with the lotion and the peroxide developer was added to the lotion/activator mixture. Percent composition of the total mixture is as follows:

	<i>CHEMICAL NAME</i>	<i>WEIGHT %</i>
	<i>Lotion</i>	
	Polyethylene glycol ether of Oleyl Alcohol (10 moles of ethylene oxide) ¹	14.02
35	Oleic Acid	7.01
	Ethanol	4.67
	Monoethanolamine	2.80
	Ethoxylated nonylphenyl (49 moles of ethylene oxide)	2.33
40	<i>Developer</i>	
	Hydrogen Peroxide (50% aqueous solution)	6.89
	Water	49.18
	<i>Activator</i>	
45	Potassium Persulfate	2.95
	Ammonium Persulfate	0.92
	Sodium Persulfate	2.95
	Disodiummethylenediamine tetraacetic acid	0.13
	Sodium meta silicate	6.15
50		100.00
	Water-soluble phase - 100%.	
	Ammonium ion concentration - 0.15%	
	1. Trade Name: Brij 96	
55	2. Trade Name: Igepal DM 880	
	Note: All of the oleic acid was converted to the water-soluble salt form.	
	Lightening was measured in accordance with the test method procedure except that a 15 g. bundle of commercially available pigmented virgin hair approximately 9 inches long was bleached for 1 hour. The bleaching was conducted in a glass tray placed atop a constant temperature bath maintained at 39°C.	
65	<i>EXAMPLE 2</i>	
	Three component system; 60 g. of lotion; 120 g. of developer; 28 g. of activator (208 g. total) was mixed as described in Example 1. Percent composition is as follows:	
70		
	<i>CHEMICAL NAME</i>	<i>WEIGHT %</i>
	<i>Lotion</i>	
	Polyethylene glycol ether of Lauryl Alcohol	
	(23 moles of ethylene oxide) ¹	0.48
75	Polyethylene glycol ether of Oleyl Alcohol (10 moles of ethylene oxide) ²	24.40
	Ethanol	3.84
	Monoethanolamine	0.12
80	<i>Developer</i>	
	Hydrogen Peroxide (50% aqueous solution)	7.10
	Water	50.60
	<i>Activator</i>	
85	Potassium Persulfate	3.03
	Ammonium Persulfate	0.94
	Sodium Persulfate	3.03
	Disodiummethylenediamine tetraacetic acid	0.13
	Sodium Metasilicate	6.33
90		100.00
	Water-soluble phase - 100%.	
	Ammonium ion concentration - 0.15%	
	1. Trade Name: Brij 35	
95	2. Trade Name: Brij 96	

EXAMPLE 3

Three component system; 66 g. of lotion; 120 g. of developer and 28 g. of activator (214 g. total) were mixed as previously described. Percent composition

5 is as follows:

	CHEMICAL NAME	WEIGHT %
	<i>Lotion</i>	
	Laurate esters of sorbitol and sorbitol anhydrides condensed with 80 moles of ethylene oxide ¹	23.36
10	Polyethylene glycol ester of oleic acid (5 moles of ethylene oxide) ^{2*}	4.67
	Monoethanolamine	2.80
	<i>Developer</i>	
15	Hydrogen Peroxide (50% aqueous solution)	6.89
	Water	49.18
	<i>Activator</i>	
	Potassium Persulfate	2.95
20	Ammonium Persulfate	0.92
	Sodium Persulfate	2.95
	Disodium Ethylenediamine tetraacetic acid	0.13
	Sodium Metasilicate	6.15
25		100.00
	Water-soluble phase - 95.33%.	
	Ammonium ion concentration - 0.15%	
30	1. Trade Name: Tween 80	
	2. Trade Name: Emulphor VN-430	

EXAMPLE 4

Three component system; 60 g. of lotion; 120 g. of developer and 28 g. of activator (208 g. total) were mixed as previously described. Percent composition is as follows:

	CHEMICAL NAME	WEIGHT %
	<i>Lotion</i>	
	Oleic Acid	6.34
	Ethoxylated Cocoyl Fatty Acid (8.5 moles of Ethylene oxide) ¹	9.23
45	Ethoxylated Nonylphenol (4.0 moles of ethylene oxide) ^{2*}	3.10
	Polyethylene glycol amine of Soya Acid (5.0 moles of ethylene oxide) ^{3*}	2.88
	Ethanol	1.55
	Polypropylene glycol ether of cetyl alcohol (5.0 moles of ethylene oxide) ⁴	5.77
50	Perfume	0.08
	Ammonium Hydroxide (59% aqueous solution)	0.29
	<i>Developer</i>	
55	Hydrogen Peroxide (50% aqueous solution)	7.10
	Water	50.20
	<i>Activator</i>	
	Potassium Persulfate	3.03
60	Ammonium Persulfate	0.94
	Sodium Persulfate	3.03
	Disodiummethylenediamine tetraacetic acid	0.13
	Sodium Metasilicate	6.33
65		100.00

- Water-soluble phase – 94.02%
 Ammonium ion concentration – 0.24%
1. Trade Name: Nu-Mole 7A-CM
 2. Trade Name: Igepal CO-430
 3. Trade Name: Ethomeen S-15
 4. Trade Name: Procetyl 50

EXAMPLE 5

Two component system; 88 g. of activator is mixed with 120 g. of developer (208 g. total). Percent composition is as follows:

	CHEMICAL NAME	WEIGHT %
	<i>Activator</i>	
15	Ethoxylated nonylphenol (150 moles of ethylene oxide) ¹	12.79
	Polyethylene glycol diester of stearic acid (150 moles of ethylene oxide) ²	0.78
	Palmitic acid ³	2.19
	Disodiummethylenediamine tetraacetic acid	0.26
20	Sodium Metasilicate	11.75
	Sodium Persulfate	5.88
	Potassium Persulfate	5.88
	Ammonium Persulfate	2.78
25	<i>Developer</i>	
	Ethoxylated nonylphenol (4.0 moles of ethylene oxide) ⁴ *	2.89
	Ethoxylated nonylphenol (9.0 moles of ethylene oxide) ⁵	2.89
	Cetyl Alcohol*	0.14
	Hydrogen Peroxide (50% aqueous solution)	7.09
30	Water	44.68
		<hr/> 100.00

- Water-soluble phase – 96.97%.
 Ammonium ion concentration – 0.440%.
1. Trade Name: Igepal DM-970
 2. Trade Name: PEG 6000 Distearate
 3. Trade Name: Neo-Fat 16
 4. Trade Name: Igepal CO 430
 5. Trade Name: Igepal CO 630

EXAMPLE 6

Three component system; 60 g. of lotion; 120 g. of developer and 29 g. of activator (208 g. total) were mixed as previously described. Percent composition is as follows:

	CHEMICAL NAME	WEIGHT %
	<i>Lotion</i>	
50	Oleic Acid	7.21
	Ethoxylated Cocyl Fatty Acid (8.5 moles of ethylene oxide) ¹	6.35
	Ethoxylated nonylphenol (4.0 moles of ethylene oxide) ² *	2.02
	Ethylhydroxymethyl oleyl oxazoline ³ *	3.97
55	Polyethylene glycol amine of Soya Acid (5.0 moles of ethylene oxide) ⁴ *	2.88
	Ammonium hydroxide (59% aqueous solution)	0.29
	Ethanol	1.15
	Polypropylene glycol ether of cetyl alcohol (5.0 moles of ethylene oxide) ⁵	4.90
60	Fragrance	0.07
	<i>Developer</i>	
	Hydrogen Peroxide (50% of aqueous solution)	7.10
65	Water	44.70

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	Cetyl Alcohol*	0.14
	Ethoxylated nonylphenyl (4 moles of ethylene oxide) ^{2*}	2.88
	Ethoxylated nonylphenyl (9 moles of ethylene oxide)*	2.88
5	Activator	3.03
	Potassium Persulfate	0.94
	Ammonium Persulfate	3.03
	Sodium Persulfate	0.13
	Disodiummethylenediamine tetraacetic acid	6.33
10	Sodium Metasilicate	
		100.00

- 15 Water-soluble phase - 88.11%
 Ammonium ion concentration - 0.24%
 Alkaline solubility - 30.7%
- 20 1. Trade Name: Nu-Mole CM-7A
 2. Trade Name: Igepal CO-430
 3. Trade Name: Alkaterge E
 4. Trade Name: Ethomeen S-15
 5. Trade Name: Procetyl 50
 6. Trade Name: Igepal CO-630

EXAMPLES 8-14

25		#8	#9	#10	#11	#12	#13	#14
	NH ₄ OH (29%)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Nu-Mole CM-7A	8.0	x	4.0	x	4.0	x	x
	Laureth-40	x	8.0	4.0	x	x	x	x
30	PPG-50 Cetyl Ether ²	x	x	x	8.0	4.0	x	x
	Nonyl Nonoxynol-49 ³	x	x	x	x	x	8.0	x
	Peg 400 Monolaurate ⁴	x	x	x	x	x	x	8.0
	K ₂ S ₂ O ₈	x	4.0	4.0	2.0	4.0	4.0	4.0
	Na ₂ S ₂ O ₈	4.0	x	x	2.0	x	x	x
35	H ₂ O ₂	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	Sodium Metasilicate	6.2	6.2	6.2	6.2	6.2	6.2	6.2
	Water	74.8	74.8	74.8	74.8	74.8	74.8	74.8

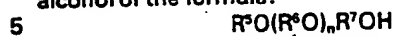
- 40 1. Polyethylene glycol ether of lauryl alcohol (40 moles ethylene oxide).
 2. Polypropylene glycol ether of cetyl alcohol (50 moles of ethylene oxide).
 3. Ethoxylated dinonylphenol (49 moles of ethylene oxide).
 4. Polyethylene glycol ester of lauric acid (400 moles of ethylene oxide).

CLAIMS

- 45 1. A thickened hair bleaching composition comprising a water phase, accounting for from about 80 to 100 weight percent of the total composition, said water phase comprising based on the total composition:
- 50 (a) 2 to 20 weight percent of at least one percompound selected from the group consisting of an ammonium-, alkali metal- and alkaline earth metal-perborate, persulfate, percarbonate, and carbonate peroxide;
- 55 (b) 1.5 to 7 weight percent of hydrogen peroxide;
- (c) an amine or quaternary ammonium compound selected from the group consisting of ammonium hydroxide, morpholine, mono-, di-, and trialkanolamine, and mono-, di-, and trialkylamine, wherein the alkyl or alkanol substituents have a carbon chain length of 1 to 4 carbon atoms;
- 60 (d) 4-8 weight percent of at least one water-soluble surfactant thickener;
- (e) a buffering agent for maintaining the composition at a pH of from about 9 to 12; and
- 65 (f) the balance is water, wherein the ammonium ion concentration in the water phase is less than about 0.55 weight percent based on the total composition resulting in substantially only trace amounts of ammonia gas produced as a result of interaction of these ingredients with each other or with hair.
- 70 2. The composition of Claim 1 additionally containing up to about 0.5 weight percent of a sequestering agent.
- 75 3. The composition of Claim 1 additionally containing up to about 1.5 weight percent of a viscosity modifier selected from the group consisting of a water-soluble straight chain aliphatic alcohol, aldehyde, ketone, glycol, and mixtures thereof, having a carbon chain length of 1 to 6 carbon atoms.
- 80 4. The composition of Claim 1 additionally containing up to about 20 weight percent of at least one additional water-soluble ingredient selected from the group consisting of surfactants, perfumes, oils, opacifiers, and dyestuffs.
- 85 5. The composition of Claim 1 wherein said

water-soluble surfactant thickener is selected from the group consisting of:

(a) an alkylene glycol or an alkylene glycol ether alcohol or the formula:



wherein R^5 is H or alkyl having 1 to 4 carbon atoms and R^6 and R^7 are divalent alkylene radicals having 2 to 4 carbon atoms and n is a number from 0 to 150;

(b) a long chain fatty acid soap of the formula



wherein R^8 is the hydrocarbon moiety of a long chain fatty acid having 10 to 20 carbon atoms, M is a monovalent or polyvalent salt-forming group and "a" is the valance of group M ;

15 (c) a long chain polyoxyalkylated compound selected from the group consisting of a polyoxyalkylated long chain fatty alcohol, a polyoxyalkylated polyhydroxyalkyl ester of a long chain fatty acid; a polyoxyalkylated long chain amine; a polyoxyalkylated long chain fatty acid; a polyoxyalkylated long chain fatty acid amide; a polyoxyalkylated long chain alkylphenol and polyoxyalkylated laurate esters of sorbitol and its anhydrides containing about 8 to 300 oxyalkyl groups in the structure; and

25 (d) mixtures thereof.

6. The composition of Claim 5 wherein said percompound weight percent (a) is about 6 to 8.

7. The composition of Claim 6 wherein said hydrogen peroxide weight percent (b) is about 3.2 to 3.7.

30 8. The composition of Claim 7 wherein said pH is about 9.7 to 10.3.

9. The composition of Claim 8 wherein said water-soluble surfactant thickener (d) is cocoyl fatty acid ethoxylated with 8.5 moles of ethylene oxide.

35 10. A hair bleaching composition substantially as hereinbefore described in any one of the Examples.

11. A method of bleaching hair, comprising the step of applying to the hair a composition in accordance with any one of Claims 1 to 10.

40 12. The ingredients of the composition of Claim 1 when sold in a multi-part package comprising as the first part of the percompound, as the second part the amine or quaternary ammonium compound, with the surfactant and the buffering agent being incorporated in the first part or the second part or both,

45 and with the hydrogen peroxide being supplied separately.

13. The ingredients of the composition of Claim 1 when sold in a multipart package comprising as the first part the percompound, as the second part the amine, and as the third part the hydrogen peroxide, with the surfactant and the buffering agent being incorporated in the first part or the second part or both.

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